

CLAIMS

WHAT IS CLAIMED IS:

1. An attachment system for an article of manufacture, comprising:
 - 5 a first member having a first flange providing a first attachment surface;
 - a second member having a second flange providing a second attachment surface, the second surface opposing the first surface, at least one of the first member and second member being a panel; and
 - 10 a structural adhesive material adhered to the first surface and the second surface, the structural adhesive material having a tensile strength of at least 12 MPa.
2. An attachment system as in claim 1 further comprising a sealant material sealing a gap between the first member and the second member and
 - 15 concealing the adhesive material from an environment surrounding the article of manufacture.
3. An attachment system as in claim 1 wherein a layer of primer and a layer of paint are disposed directly over the adhesive material
 - 20 concealing the adhesive material from a surrounding environment and providing a Class A or a Class B finish.
4. An attachment system as in claim 2 wherein the structural adhesive material is directly adjacent the sealant material.
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5. An attachment system as in claim 2 wherein the sealant material and the structural adhesive material provide substantially the only attachment between the first surface and the second surface.
- 30 6. An attachment system as in claim 3 wherein the structural adhesive material provides substantially the only attachment between the first surface and the second surface.

7. An attachment system as in claim 2 wherein the sealant material and the structural adhesive material provide attachment between the first member and the second member without the assistance of any welds.

5 8. An attachment system as in claim 3 wherein the structural adhesive material is applied to at least one of the first surface and the second surface with a mini-applicator.

9. An attachment system as in claim 8 wherein the mini-applicator
10 includes an extruder.

10. An attachment system as in claim 2 wherein the sealant material is at least 50 % by weight elastomer.

15 11. An attachment system as in claim 2 wherein the sealant material is coated with a paint.

12. An attachment system as in claim 2 wherein the sealant material extends substantially continuously along the first surface of the first
20 member.

13. An attachment system as in claim 3 wherein the adhesive material is formed from a heat activatable material that expands at a temperature encountered during at least one of an automotive e-coat and an
25 automotive painting operation.

14. An attachment system for an automotive vehicle, comprising:
30 a roof panel of the automotive vehicle, the roof panel having a flange extending at an angle from the roof panel, the flange providing an attachment surface;

a side body panel of the automotive vehicle, the side body panel having a flange extending at an angle from the side body panel, the flange of the side panel also providing an attachment surface;

a structural adhesive material adhered to the attachment surface of the roof panel and the attachment surface of the side panel, the structural adhesive material being an epoxy-based structural foam; and

5 a sealant material sealing a gap between the roof panel and the side panel;

wherein the sealant material conceals the structural adhesive material from an environment surrounding the automotive vehicle and wherein the sealant material, the adhesive material or both provide substantially the only structural attachment between the attachment surface of the roof panel and 10 the attachment surface of the side panel without assistance of welds between the attachment surfaces.

15. An attachment system as in claim 14 wherein the structural adhesive material is directly adjacent the sealant material.

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16. An attachment system as in claim 14 wherein the sealant material and the structural adhesive material provide substantially the only attachment between the attachment surface of the roof panel and the attachment surface of the side panel.

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17. An attachment system as in claim 14 wherein the structural adhesive material is applied to at least one of the attachment surface of the roof panel and the attachment surface of the side panel with a mini-extruder.

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18. An attachment system as in claim 14 wherein the sealant material is at least 50 % by weight elastomer and is coated with a paint.

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19. An attachment system as in claim 14 wherein the adhesive material is formed from a heat activatable material that expands at temperature encountered during at least one of an automotive e-coat and an automotive painting operation.

20. An attachment system for an automotive vehicle, comprising:
an outer roof panel of the automotive vehicle wherein:

- i) the roof panel includes a side edge and a flange substantially coextensive with the side edge;
- ii) the flange extends downwardly at an angle relative to the roof panel; and
- 5 iii) the flange provides an attachment surface; an inner roof panel of the automotive vehicle wherein:
 - i) the inner roof panel includes a first flange extending downwardly at an angle relative to the inner roof panel; and
 - 10 ii) the inner roof panel includes a second flange extending outwardly from its first flange;
- a side body panel of the automotive vehicle wherein:
 - i) the side body panel includes a first flange extending downwardly at an angle from the side body panel;
 - 15 ii) the side body panel includes a second flange extending from its first flange, the second flange of the side panel overlapping the second flange of the inner roof panel; and
 - iii) the first flange of the side panel provides an attachment surface; a structural adhesive material adhered to the attachment surface of the outer roof panel and the attachment surface of the side panel, the structural adhesive material being an epoxy-based structural foam;
- 20 a sealant material sealing a gap between the roof panel and the side panel wherein:
 - i) the sealant material is adhered to the attachment surface of the outer roof panel;
 - 25 ii) the sealant material conceals the structural adhesive material from an environment surrounding the automotive vehicle; and
 - iii) the sealant material, the adhesive material or both provide substantially the only structural attachment between the attachment surface of the roof panel and the attachment surface of the side panel.
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21. An attachment system as in claim 20 wherein the sealant material is at least 50 % by weight elastomer and is coated with a paint and wherein the adhesive material is formed from a heat activatable material that

expands at temperature encountered during at least one of an automotive e-coat and an automotive painting operation.